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Short-time increase of glucose concentration in PDS results in extensive removal and high glycation level of vital proteins during continuous ambulatory peritoneal dialysis

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Background: Renal diseases constitute a major health risk in all societies. The prevalence of end-stage renal disease (ESRD) in adult European populations is above 10% with tendency to increase, posing a serious health threat. The treatment of ESRD involved the use of various dialysis procedures or kidney transplantation. Continuous ambulatory peritoneal dialysis (CAPD) uses the well flow peritoneum as a biological semipermeable membrane without an extra corporal blood circulation. Glucose solution is commonly used as dialysate compound. In our present study, we investigated the impact of short-time alteration of the glucose concentration and the osmolarity of the peritoneal dialysis solution (PDS) on protein removal.

Methods: Peritoneal dialysis liquids (PDL) were collected from 19 well-characterized CAPD patients treated with two types of PDS. The patients were subjected to short-time changes (4 h) of glucose concentration of PDS. The depletion of the six-interfering high abundant proteins from the PDL samples was performed with the Multiple Affinity Removal LC Column-Human 6. The resulting protein fractions were analyzed by 2D gel electrophoresis, differential in gel electrophoresis, mass spectrometry and 2D western blot.

Results: Proteomics investigation of the PDL fractions after depletion allowed the identification of 198 polypeptides, which equate to 48 non-redundant proteins. Comparative analyses of 2D gel electrophoresis protein pattern revealed a clear correlation between protein removal, PDS glucose concentration and osmolarity. An increase for 4 h in the PDS osmolarity (with 43-51 mOsmol/L) resulted qualitatively in 18-23% more protein removal in PDL. Moreover, 2D western blot analyses of the protein glycation pattern showed that the short-time increase in PDS glucose concentration (45-50 mM) resulted in significant alteration of the advanced glycosylation end products (AGEs) pattern.

Conclusions: The data presented in this study shed light on the quality of the protein lose during CAPD due to the glucose concentration in used dialysate. Moreover, we could demonstrate that higher glucose concentration in dialysis solution results in increased AGEs.

Biography

Marwa Eltoweissy has completed her PhD through a scholarship and cooperation work between faculty of Science, Alexandria University, Egypt and Rheinische Friedrich-Wilhelms-University Medical Center Bonn, Institute for Physiology II, Germany. She achieved Postdoctoral studies at the Gastroenterology and Endocrinology department, Georg-August University Medical Center, Göttingen, Germany. She received the Doctor of Natural Sciences degree through her work at the Nephrology and Rheumatology department, Georg-August University Medical Center, Göttingen, Germany. She worked as a major Scientific Researcher at the later department and is an Assistant Professor of Physiology at the Zoology department, Alexandria University, Egypt. She has published more than 30 papers in reputed journals and is serving as a reviewer for privileged journals. She has been involved in many international conferences and workshops as a speaker, member of Scientific Program Committees, Organizer, Session Chair/Co-chair and in conferences moderation. She is a Member of the Editorial Board of two journals in proteomics.

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